

## ABSTRACT

A low- $k$  dielectric material for use in the manufacture of semiconductor devices, semiconductor structures using the low- $k$  dielectric material, and methods of forming such dielectric materials and fabricating such structures. The low- $k$  dielectric material comprises carbon nanostructures, like carbon nanotubes or carbon buckyballs, that are characterized by an insulating electronic state. The carbon nanostructures may be converted to the insulating electronic state either before or after a layer containing the carbon nanostructures is formed on a substrate. One approach for converting the carbon nanostructures to the insulating electronic state is fluorination.